FOREST PRODUCTS
Project Fact Sheet

MODEL-BASED APPROACH TO SOFT-SENSING AND DIAGNOSIS FOR CONTROL OF A CONTINUOUS DIGESTER

BENEFITS

- Reduces pulp and paper quality variations
- Minimizes chemical usage, thereby limiting adverse environmental impacts
- Advances operator confidence and control
- Increases customer satisfaction
- Raises productivity and process reliability
- Improves operability through rate and grade transitions
- Increases energy efficiency

APPLICATIONS

This technology will provide a continuous digester control prototype for commercialization. This sensor could also be applied to batch digesters and provide the basis for development of more model-based methods of soft sensing, diagnostics, and control.

Computing-Based Modeling and Control Technology Expected to Save Energy and Improve Productivity

The pulp digester is known as the bottleneck unit in the pulp mill flowsheet because it can occupy from 5 to 50 percent of typical on-line operation time, making this component of the pulping process very capital intensive. Improving digester performance can significantly reduce production losses, operating costs, and negative environmental effects while at the same time increasing paper quantity and quality.

Implementation of faster, continuous digester technology is difficult because it can lead to system problems throughout the mill. The use of a computer-based model and control system for continuous digesters has the potential to regulate the pulping process, thereby minimizing mill downtime caused by digester problems, and fostering continuous operation and pulp production.

Previous work conducted at the University of Delaware (UD) indicated that fundamental models are capable of managing the internal conditions within the digester. Development of a fundamental digester model at UD will form the basis for the early activities of the project. Managing production rate changes and grade swings between hardwood and softwood feedstocks will be the major challenge to the design of this technology.

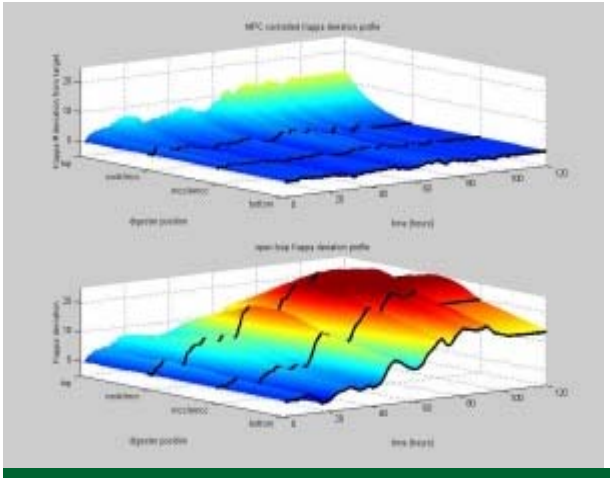


Figure 1 - Digester profile disturbance response to feed property variations under open-loop policy (bottom) and under model-based profile control (top).

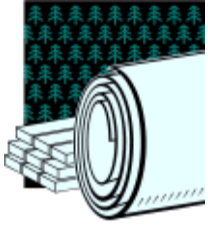
PROJECT DESCRIPTION

Goal: To develop and demonstrate modeling and control methodologies for continuous pulp digesters

Relying on a fundamental process model of the digester, this three year project is designed to integrate physical and chemical properties as "states" of the system to track grade transitions in the newer model. This new method will allow calculation of appropriate material, energy balance, and diffusion simulations as various-origin chips pass through the digester. The collaborating vendors in the project will develop a prototype software tool with intuitive user interfaces and a numerical solution for multiple wood species. Review and feedback from participating industry members will be gathered after an industry workshop is held to bridge the gap from academic research to industrial commercialization and use.

PROGRESS & MILESTONES

- Several Weyerhaeuser and Westvaco mills have been selected as testing sites.
- A modified multi-grade continuous digester model was developed in the first quarter of the project.
- A new mixing parameter was introduced to predict the evolution of the reaction front in the reactor.



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